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Is There Any Cointegration between Turkey's And Greece's Military Expenditures?

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Abstract: This study concerns about the long-run relationship between Turkey's and Greece's military expenditures due to the hostility of these two neighboring and NATO ally countries. Our data range from 1949 to 2001. After checking the series whether they are stationary or not based upon Augmented Dickey-Fuller test, we apply to Johansen's cointegration test to see the long-run connection. Our empirical findings support the long-run relationship between these two countries military expenditures. We also checked the ECM to see how the cointegrating vector feeds back on the military expenditures of the two countries.

Keywords: Cointegration, Military Expenditures, Turkey, Greece
JEL classification: H56, C22

Türkiye Ve Yunanistan'ın Askeri Harcamalarında Bir Eşbütünleşme Var Mı?

Özet: İki NATO üyesi ve aynı zamanda iki komşu ülke olan Türkiye ve Yunanistan aralarındaki husumetten dolayı bu ülkelerin askeri harcamalarında uzun dönemli bir ilişki olabileceği varsayımı bu çalışmada incelenecektir. Ilgilenilen dönem 1949 ve 2001 arasıdır. Augmented Dickey-Fuller testi ile serilerin durağanlığına bakıldıktan sonra Johansen eşbütünleşik testi uygulanarak uzun dönemli bir ilişkinin var olup olmadığı araştırılmıştır. Ampirik bulgular ilgili dönemde iki ülkenin askeri harcamaları arasında uzun dönemli bir ilişkinin varlığını göstermektedir. Hata düzeltme modeli (ECM) ile iki ülkenin askeri harcamalarının birbirlerini nasıl beslediklerini de gösterilmiştir.

Anahtar kelimeler: Eşbütünleşme, Askeri Harcamalar, Türkiye, Yunanistan
JEL sınıflaması: H56, C22

INTRODUCTION

The dispute between Turkey and Greece has been a long standing issue. From time to time it is observed that these two countries almost engage in clashes. Historically, the dispute starts with the Ottoman Empire. Today, they have problems in Aegean Sea and, of course, the Cyprus issue. When there was a military coupe in Cyprus, the civilian Cyprus Government and the President Archbishop Makarios was overthrown, Turkey sent troops to the Island 1974.

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Since then, the Island has been divided between Greeks and Turks and the dispute is still on going. Furthermore, when Greece attempted to extend its territorial waters to 12 miles in Aegean Sea in late 1980s, Turkey declared such an attempt as casus belli. Of course, the oil exploration activities in Aegean Sea also brought the two countries almost into open conflict. We should also add the minorities living in both countries. Even though Turkey and Greece are the NATO allies, Greece always feel uneasy toward its eastern border neighbor. Such disputes between these NATO allies and neighboring countries escalate the tension from time to time. Therefore, we expect that these two countries' military expenditures are somehow connected. Hence, it is the purpose of this study to investigate whether there exists a long-run relationship between these two countries' military expenditures in the period between 1949-2001.

It is not easy to determine military preparations in arms race models. When the tension is high and for the possible conflict, two countries' military capital level of forces will play an important role. As far as the military capital is concerned, we are talking about the size of the army and the fire arms capacity. Besides, being able to utilize these forces will determine the capability. In this sense, training, tactics and leadership will also play a crucial role in a country's fighting capability. In this study we will take each country's military expenditure as of their GDP shares. Since expenditure is related with both quantity and quality of the military capacity, it is taken as an indicator of their military strength.

The rest of the paper is organized as the following. The next section gives literature review and then the section three talks about where the data come from and which methodolgy we apply to. The fourth section deals with our empirical findings and finally the last section concludes the paper.

LITERATURE REVIEW

Due to the hostility between Turkey and Greece, a fair amount of studies is done about their military expenditures. In general, the empirical work concentrates on the relationship between these two variables. Here we also concentrate on the relationship between these two variables for the period between 1949 and 2001. Our study covers longer period than the current literature does.

(Andreou and Zombanakis, 2006) investigate why there are controversial results about arms race between Turkey and Greece. Their suggestion is that this is so because of different techniques authors apply to. Since they utilize traditional techniques to detect the arms race between Turkey and Greece, they encounter model specification problems and using dummy variables extensively. The authors suggest that we should switch from tradional methods to artificial intelligence methods which give an advantage of relieving the researcher from

model constraint and consequences of a specification error.

(Dunne, and others, 2005) first applied to Classic Ricardson model and showed that the results are very sensitive to the model spesification and dummy variables are strategically important. They also applied to VAR test and found out that there is no cointegration between the two variables. The reason they stated was due to the small sample and model spefication problem. When they utilized the step dummy variable representing 'Cyprus crisis' they found the cointegrating vector. Yet the values of the long run coefficients were counterintuitive. They concluded that the connection between military expenditures of Turkey and Greece is not a simple Richardson model. It is an underlying VAR model in both countries military spending and GDP.

(Collier and Hoeffler, 2005) modeled the military expenditure for the period between 1960-1996 for the developing countries. They found that there seems to be regional arms race going on, which is called a regional public "bad". In particular, they estimated that if there were no aid to Africa, the African military expenditure would double. They also concluded that military spending does not reduce the risk of rebellion. Therefore, military spending is primarily against international war.

(Yıldırım and Sezgin, 2002) investigated the relationship between defense spending and spending on education and health between 1924 and 1996 for Turkey. It is hypothesized that due to the large share of military in budget, education and health spending will be crowded out. They employed the seemingly unrelated regression (SUR) estimation technique in a multi-equation framework. Their model was based on Russett's (1982) model. They found that there is a trade off between defense and welfare spending. Yet, their findings suggest that they are different for education and health expenditures. Although there is a trade off between defense and health, it is positive for education.

(Smith, and others, 2000) examined the arms race between Greece and Turkey. They applied two-by-two game such as Prisoner's Dilemma model. They simply treated the arms race as an iterated simple game. Thus, assuming each country knows the opponent's strategy, each year Turkey or Greece can choose either a high or low share of military expenditure. The countries can also utilize the mixed strategy. They utilized the bivariate Hamilton regime-switching model covering the years 1958-1997. They rejected the hypothesis which is playing tit-for-tat strategy; Greece leads and Turkey follows or Turkey leads and Greece follows. They concluded that that military spending for both countries are determined by other factors than antagonism between these two countries.

Brauer (2002) gives detailed survey about the arms race between Turkey and

Greece. Yet, he could not find a robust Ricardson-type arms race between these two countries. He found that there are other variables affecting military expenditures in both countries rather than each others' military expenditures.

Although there are some studies done about this subject, the results are mixed and the literature does not cover this time of the period that we concern. Furthermore, most of the literature utilize the SIPRI data while this study uses the NATO data. Therefore, this could indicate whether the results are data sensitive. Hence, this will enable us to have better inside story. We will investigate the long-run relationship between Turkey's and Greece's military expenditures.

DATA AND METHODOLOGY

Countries military expenditures data come from the NATO web site.[1] The NATO publishes the updated figures for each member country on the defence expenditures annually. The GDP and military expenditure values are reported at local currencies in current prices. We take the percentage value of military expenditure over GDP for each country. Thus the number represents what percentage of the country's GDP was spent on military in certain year. These figures are based on the NATO definition of defence expenditures. The NATO definition includes military personnel, civilian pay, major equipment and supply procurement, construction and infrastructure costs, and pensions to retired military personnel, host government expenses for NATO forces, NATO infrastructure and civilian staff costs and military aid to other nations. So those countries which provide military assistance will have higher numbers since these expenditures are included in calculation. Figures also include expenditures for research and development. Further information can be obtained from their web site. Turkish and Greek GDP data is obtained from Turkish Central Bank[2] and IMF,[3] respectively.

The data we have used here is the military expenditure of each country as a percentage share of their GDPs. This allows us to make a useful comparison between these two countries.

Since the data is presented in the time series format, the following formula will be utilized:

$$Y_{it} \quad \beta X_{it} \quad u_{it} \qquad (1)$$

[1] http://www.nato.int/issues/defence_expenditures/index.html accessed 11.10.2006
[2] http://tcmbf40.tcmb.gov.tr/cbt.html accessed 17.10.2006
[3] http://ifs.apdi.net/imf/logon.aspx accessed 19.9.2006

Y_{it} represents Turkey's military expenditure in time *t*. β is the coefficient variables and X_{it} is Turkey' neighbors' military expenditure in time *t*. In order to check whether series are stationary or not, Dickey Fuller Augmented (ADF) test procedure developed by (Dickey and Fuller, 1979) is applied. Thus, the ADF test requires running the following regression for both level and first difference of each variable, separately.

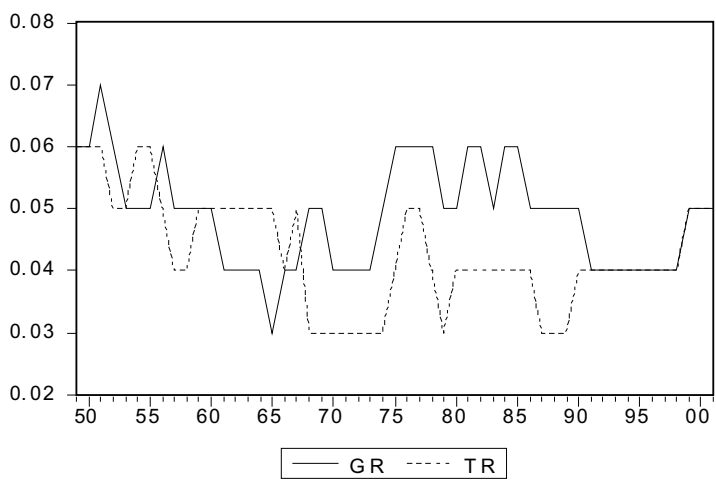
$$\Delta y_t \quad \alpha \quad \beta y_{t-1} \quad \sum_{i=1}^{k} \gamma \Delta y_{t \quad i} \quad u_t \qquad (2)$$

where Δy represents the first difference of y series, u is the residual term, α is a constant term and k is the lagged values of Δy_t which are included to allow for serial correlation in the residuals. The ADF test allows us to test for nonstationary of the series, y, to a t-test of $\beta = 0$. The alternative hypothesis of stationary requires that β be significantly negative. If the absolute value of the computed t-statistics for β is bigger than the absolute critical value, then the null hypothesis that the log level of y series is not stationary must be rejected against its alternative. Yet, if it is less than the critical value, it is concluded that the log level of y is nonstationary. In this case, the same regression must be repeated for the first difference of the logarithmic value of the series.

EMPIRICAL RESULTS

First we want to see how the series look like. The graph is shown below.

Graph 1. TR GR military expenditures in percentage



Graph 1 indicates the raw military expenditures as of their GDP shares for both countries. As it can be seen clearly that during 1974 there was a big increase due to the Cyprus war. Since both countries' military spending 4 or 5 percent of their GDPs from 1991 to 2001, the lines are together in the graph.

After that, we check whether these series are stationary. If they are nonstationary, then we can make them stationary by taking their first differences which is in general sufficient to make them stationary. After assuring both series are integrated of the same order, we can apply the Johansen cointegration test. We used the Eviews 3.0 version of the econometric program. Augmented Dickey-Fuller Stationary Test results are in the following table.

Table 1 Augmented Dickey-Fuller (ADF) Stationary Test Results

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Variables	Without Differencing	First Difference	Critical Value	
			1%	5%
Turkey's Mil. Exp (TR)	-2.896	-5.862 (1)*	-3.55	-2.91
Greece' Mil. Exp (GR)	-2.906	-7.789 (0)*	-3.55	-2.91

Note: Numbers inside the brackets denote the number of lags selected by the Akaike info criterion. The (*) indicates significant at 1 percent level. The model includes constant and no trend

Table 1 shows the Augmented Dickey-Fuller test results. Variables' lag differences are selected by the Akaike info criterion which shows that GR variable has zero lag while TR variable has 1 lag. The table above shows that we could not reject the null hypothesis indicating that series in levels are nonstationary at 5% and 1% levels. Yet, when we take the first diffences we reject the null hypothesis and conclude that the time series are integrated of order 1, that is I(1). Therefore, these results enable us to apply cointegration test to determine whether there exists any long-run relationship between these two time series.

We utilized the estimation technique proposed by Johansen (1988) to see the long run relationship. The estimated figures are in the following table.

Table 2: Johansen's Cointegration Test Results

1949-2001					
Variables	Lag-Lengths	Likelihood Ratio	Critical Value		Result
			1%	5%	
TR, GR	0, 1	16.16	20.04	15.41	Cointegrated
Note: The optimum lag-lengths are determined by the Akaike info criterion					

Table 2 shows that time series variables are cointegrated at 5% level. This indicates that there is a long-run relationship between Turkey's military expenditure (TR) and Greece's military expenditure (GR). Now, we can show the long run relationship in vectors.

$$ECM(-1)=TR+0.67GR-0.07 \qquad (3)$$

We can see that the Greece's military spending affects the Turkey's military spending positively. Since we have established the long run relationship between these two variables, we can now determine the VECM with lag (equation 3). The fallowing table shows the estimated results.

Table 3. VECM results

Dependent Variable	Causal Variable	Wald-Test	ECM (-1)	Direction of Causality
ΔTR	ΣΔGR (1)	1.963 [0.168]	0.983 [0.000]*	TR ↔ GR
ΔGR	ΣΔTR (4)	4.935 [0.002]*	0.988 [0.000]*	GR ↔ TR
The parentheses show the optimal lag-lengths of the variables which are determined by the AIC. The rectangular parentheses indicate the p-values, and * indicates significance levels at 1%.				

Table 3 shows the VECM results. This indicates that there is a bidirectional causality running from both Greece towards Turkey. Thus, one country's military expenditure causes the other country's military expenditure and vice versa.

CONCLUSION

The long period hostility between Turkey and Greece appealed many researchers attention towards their military spendings. Hence, this study also concerns about whether there exists any long-run relationship between Turkey's military expenditure and Greece's military expenditure for the period between 1949 and 2001. We apply to Johansen's cointegration test after we check these time series stationary or nonstationary. Unlike Georgiou (1990) Georgiou et al (1996) and Kollias (1991) found no evidence of arms race between Turkey and Greece, our results show that there is a long-run relationship between these two time series variables during the period of 1949-2001. It can be emphasized that unlike other studies in the literature this study covers wider range of data obtained from the Nato's web site. Our findings are supported by (Kollias and Makrydakis, 1997) and (Kollias and Paleologou, 2002) and Ocal (2002). Furthermore, we also test whether there is causality between these two series. As (Majeski and Jones, 1981) and Majeski (1985) concluded that there is causality

between Turkey's and Greece's military spendings, our findings also support the idea that there is a bidirectional causal relationship between Turkey and Greece during the concerned period.

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